(5) Clarify that the PCS ownership attribution limit is 5%, and apply this attribution standard to SMR operators (i.e., Nextel).

The result of MCI's scheme appears to be the following scenario: By completely precluding most major wireless providers from bidding on any "A"-block licenses (either in the sealed or open bidding), MCI increases dramatically its already high probability of winning the national "A"-block auction because the prices for "A"-block licenses will be much lower as a result of much more limited competition in the open auction. As a further hedge against paying too much for its national system, MCI advocates sealed second-bid auctions so that it can bid wildly, but end up paying only the price that the few other bidders still eligible to submit national bids have offered. Not content to stop there, MCI then builds in the opportunity to determine in the middle of the process whether its "A" block bid has won (by assessing the total of the sum the "A" regions), with the option of submitting its sealed national "B" bid if it has not, now having a much better idea of the value of "B"-block licenses in the wake of the "A" block oral auctions. And for good measure, MCI attempts to eliminate competition from other national consortia or SMR operators (i.e., Nextel) by imposing a strict 5% attribution limit on their ownership of a PCS licensee.

MCI's scheme should be rejected in its entirety by the Commission. What the proposal does do, however, is serve as an effective warning signal to the Commission that the public interest in permitting nationwide aggregation will be utterly defeated if the Commission allows the pool of nationwide PCS applicants to be effectively limited to one bidder. MCI's comments provide further evidence of the urgent need for the Commission to re-examine its PCS eligibility and attribution rules on reconsideration.

B. Treatment of Designated Entities

Comments thus far have provided additional support for Bell Atlantic's view that long-term designated entity participation in PCS will be promoted by actively encouraging strategic alliances between such entities and consortiums that include experienced wireless and wired telecommunications providers.[45/] Once again, to the extent that the PCS attribution rules have significantly restricted or limited the participation of cellular companies or cellular-affiliated LECs to form or participate in consortiums that will hold PCS licenses for large regions, the participatory benefits afforded to designated entities and smaller entrepreneurs have been unnecessarily diminished by the Commission. Thus, whatever the outcome of the Commission's re-examination of eligibility issues and attribution thresholds for holding PCS licenses on reconsideration of the PCS Order, the Commission should waive current attribution or eligibility restrictions on holding PCS licenses for the specific purpose of promoting the formation and entry into the bidding process of consortiums that include designated entity groups as meaningful equity partners. Cellular or cellular-controlled entities who might otherwise be ineligible for holding PCS licenses in-region should nevertheless be allowed to hold and operate such PCS licenses if they do so as

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45/ The National Association of Minority Telecommunications Executives and Companies ("NAMTEC"), for example, has observed that encouraging strategic alliances with large entities "will help designated entities gain access to larger markets, to more sources of capital, and to increase service opportunities." Comments of NAMTEC at 19; see also Comments of the American Wireless Communication Corporation at 27-28 (strategic partnerships with larger entities "will help designated entities gain access to larger markets, to more sources of capital, and to increased service opportunities"); Comments of George E. Murray at 10-14 (FCC must foster strategic alliances between established telecommunications companies); Comments of the National Association of Black Owned Broadcasters, Inc. ("NABOB") at 6 ("The Commission should make certain that its policies encourage major companies planning to bid for the desirable MTA areas to join with minority owned companies to bid for those areas.").

non-controlling members of PCS consortiums in which designated entities hold significant equity interests.[46/]

IV. OTHER AUCTION ISSUES

A. Mutually Exclusive Unserved Area Applications

Like Bell Atlantic, other commenters who addressed the issue support the Commission's proposal to license mutually exclusive unserved area applications filed prior to July 26, 1993, by auction rather than by lottery.[47/] The auction process will speed deployment of service to these areas, and will minimize abuses posed by lottery speculators.

B. Intermediate Links

Bell Atlantic also agrees with the uniform, wide-ranging opposition[48/] to the Commission's proposal to subject intermediate links to competitive bidding.[49/]

First, it is doubtful that most intermediate links meet the threshold statutory conditions to be subject to competitive bidding. By its terms, Section 309(j) permits the use of auctions as a selection mechanism for licenses only if mutual exclusivity exists among

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46/ See also PCS Order, Dissenting Statement of Commissioner Andrew C. Barrett at 4 (expressing support for in-market cellular interests if required "to include small businesses, rural telcos, minorities and women in order to operate an MTA license").

47/ See, e.g., Comments of BellSouth Corporation at 44; Comments of McCaw Cellular Communications, Inc. at 30; Comments of Southwestern Bell Corporation at 12-13.

48/ See, e.g., Comments of Ameritech at 2-4; Comments of BellSouth Corporation at 45; Comments of General Communication, Inc. at 14; Comments of McCaw Cellular Communications, Inc. at 25-29; Comments of MCI Telecommunications Corporation at 22; Comments of Pacific Bell and Nevada Bell at 18; Comments of Pactel at 8-10; Comments of Southwestern Bell Corporation at 7-12; Comments of Sprint Corporation at 21-23; Comments of Telocator at 18.

49/ Auction Notice at 10, ¶ 29.

applications that have not been accepted for filing.[50/] Point-to-point microwave applications are subject to prior frequency coordination such that mutual exclusivity rarely occurs. This renders the statutory basis for the invocation of competitive bidding procedures suspect, unless the Commission changes its current policy.[51/]

In this regard, as a policy matter, the Commission's current pre-application frequency coordination process combined with its first-come first-served policy of allocating links has served the Commission well, with a minimal expenditure of Commission resources. Adopting competitive bidding to license point-to-point microwave service has the potential to increase substantially the number of mutually exclusive applications filed and thereby undermine the Commission's successful frequency coordination process. There is no policy justification for such a result.

V. CONCLUSION

Designing the spectrum auctions is a formidable task for which there is no "ideal" proposal. The Commission should seek to maximize the number of bidders in the PCS auctions, and should strive in designing the auctions to find the balance that best serves its statutory and public policy objectives. Bell Atlantic urges the Commission to adopt the

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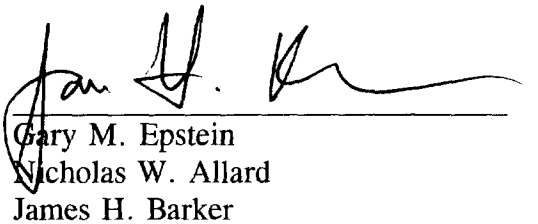
[50/] According to the Budget Act, in cases where mutually exclusive applications have been filed for a license or permit that involves a "use" of the spectrum covered by the new legislation, the FCC may use a system of competitive bidding to grant such a license or permit. A "use" of the spectrum to which the Commission may apply a system of competitive bidding is one for which the Commission determines that the principal use will involve, or is reasonably likely to involve, the licensee's receipt of compensation from subscribers in return for which the licensee enables those subscribers either to receive or transmit directly communications signals that are transmitted utilizing frequencies on which the licensee is licensed to operate. See Section 309(j)(1)(2); Auction Notice at 4-5, ¶¶ 11-12.

[51/] In addition, intermediate links are not directly involved in the transmission of subscribers' information for a fee. See Auction Notice at 8, ¶ 23. Intermediate links to backhaul wireless traffic are not functionally different from private radio licenses obtained for internal use that are exempt from competitive bidding procedures. See id. at 8, ¶ 24.

proposals set forth herein, which will lead to an efficient, rapid and fair allocation of PCS spectrum to qualified applicants in a manner that will provide tremendous benefits to American consumers.

Respectfully submitted,

BELL ATLANTIC PERSONAL COMMUNICATIONS, INC.

By: 

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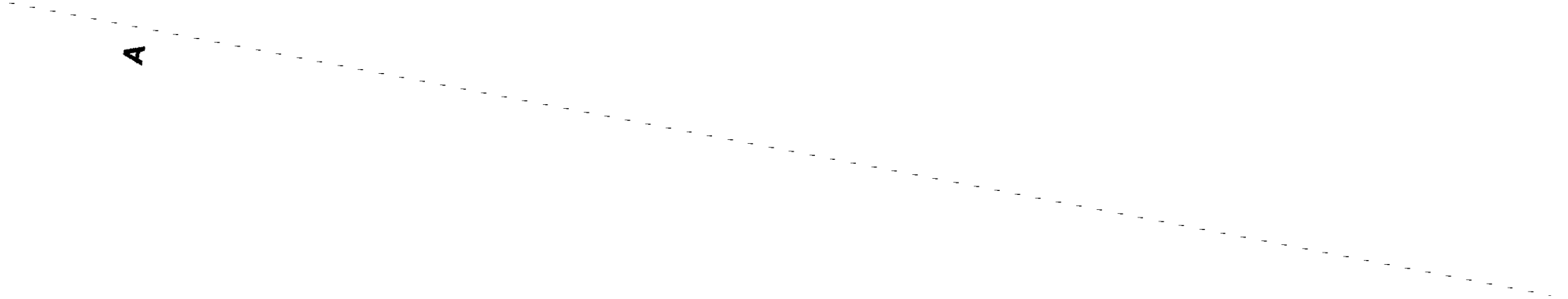
November 30, 1993


A

Response to PCS

Auction Design Proposals

by

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The design of a PCS spectrum auction is a remarkably complex task. After reading a large number of comments, it is clear that no one design can please all constituents. There is a reason for this conflict: there is no "ideal" auction design. Every design proposed, including our own, has its own set of imperfections.[1] Our goal is to find the imperfections that we can best live with.

Because there are so many issues on the table, it helped our thought process to write down a decision tree. The tree illustrates the different options available and choices to be made. The tree follows on the next page and helps organize our presentation.

Our comments in this second round focus on the main controversies from the first round of comments. We begin with a discussion of simultaneous and full combinatorial bidding and the issues therein. We then continue with a discussion of options in sequential bidding. Having discussed the alternatives, we return to discuss our original proposed auction design. One of the more complicated issues concerns the desirability of national combinatorial bidding. We propose a refinement of the national combinatorial bidding that should improve its performance while answering many of the stated objections. Considering the costs and benefits associated with simultaneous bidding has led us to adjust our original proposal to allow for a small amount of overlap in the bidding. We conclude with a detailed presentation of the auction proposal.

James Thurber, in describing how he broke up the household responsibilities, explained that he let his wife attend to the "little" issues, such as bringing up their children, while he focused on the big issues, such as relationships with China. In that sense, this is a "little" issues paper. We do not focus on whether the FCC's proposed division of 120 MHz of spectrum into seven unequal blocks is better than six blocks of 20 MHz. Nor do we focus on the issues associated with the formation of a national network. Instead, we take as a given that the spectrum will be broken up in the seven proposed bands and that aggregation of licenses into a national network will be allowed. In that context, we ask how might we improve the auction process.

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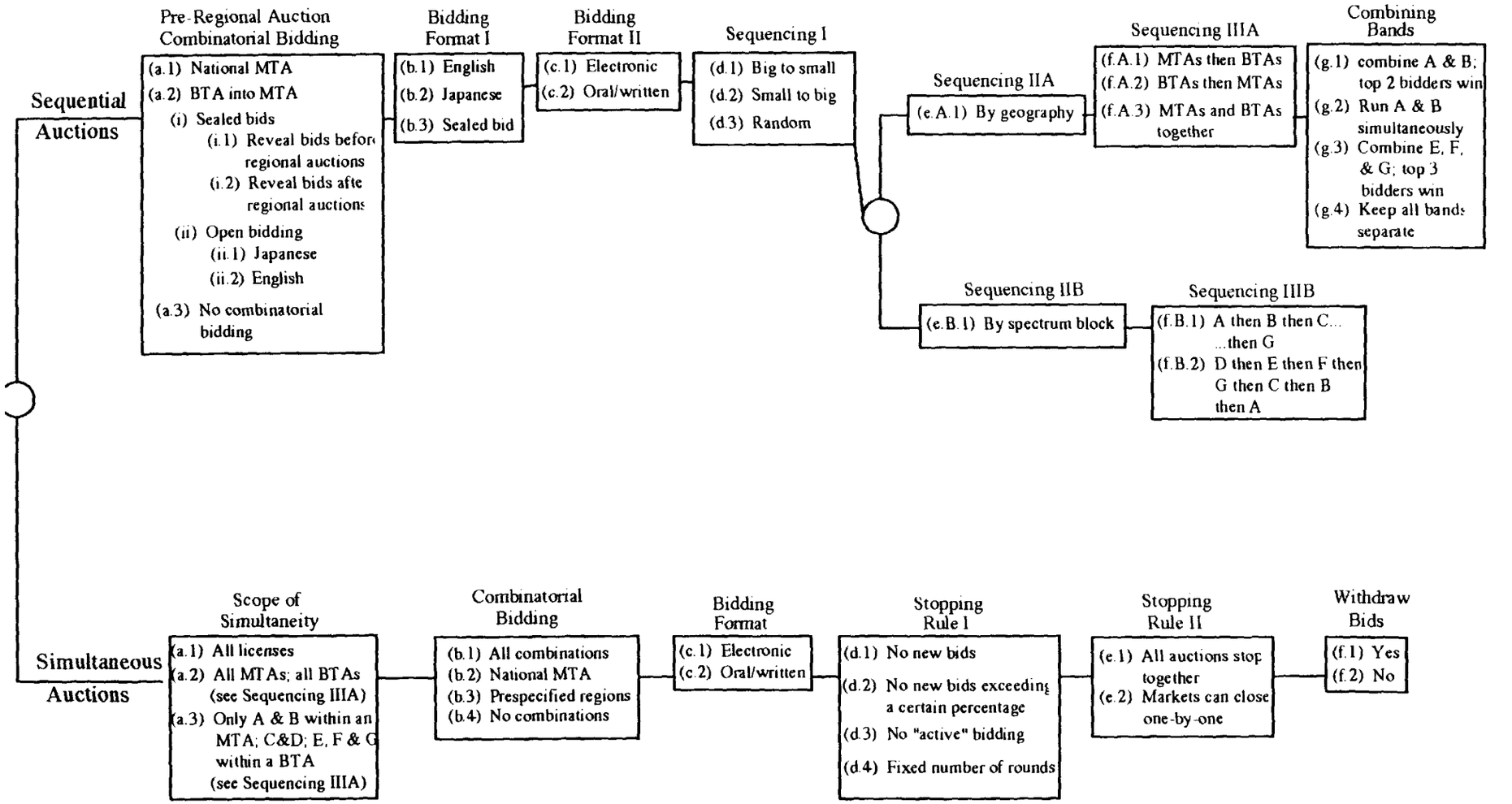
[1] Even the Groves scheme introduced in Appendix B of our first round comments is imperfect. While it induces truthful (or non-strategic) bidding and ensures an efficient allocation, this efficiency result is *conditional* on the information at the time of bidding. Because of the common value component, any one-shot sealed bid auction mechanism is informationally inefficient. The one-shot sealed bid process also has trouble dealing with budget constraints.

FCC Decision Tree



THE ISSUES

Simultaneous Bidding

Several submissions proposed that the auction be redesigned to allow for simultaneous bidding. In that discussion there were three further issues

a. Scope of simultaneity
b. Combinatorial bidding
c. Stopping rule

Sequential Bidding

The respondents who commented on the design of sequential bidding were primarily concerned with

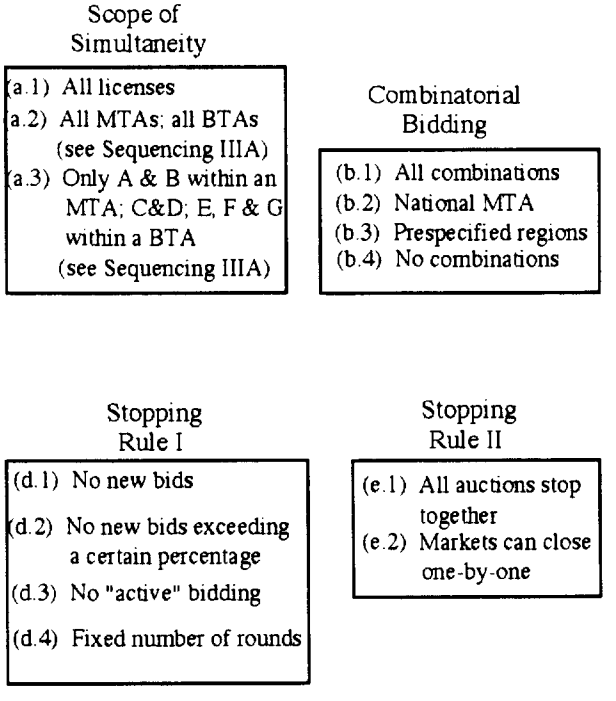
a. Pre-regional auction combinatorial bidding
b. Bidding format
c. Sequencing

The choice between simultaneous and sequential bidding appears to be one of the more controversial points in the first round of comments. We believe that the PCS auction should incorporate elements of both. Economics is the science of tradeoffs. The optimal scope of simultaneity is a balancing act. We understand the advantages of simultaneity and at the same time recognize its costs. There are theoretical and practical problems with either extreme, full simultaneity or full sequentially. Our position is that we should take a limited step toward simultaneity. As discussed in the section on auction design, we allow simultaneity across licenses within an MTA and within a BTA. We also allow a limited amount of simultaneity across regions by permitting some overlap in the bidding. A limited step towards simultaneity will help speed up the auction, reduce the need for strategy in bidding for "equivalent" licenses and provide a little more information while keeping the process manageable, predictable, and reducing the incentive to bid beyond one's budget.

To explain how we reach these conclusions, we now turn to a discussion of the proposals put forth in the first round of comments. We start at the extreme case of simultaneity and full combinatorial bidding. The problems with this approach leads us to eliminate full combinatorial bidding. We then focus on the issues associated with full simultaneity. Here too, complexity and budget constraint problems suggest a more limited and controlled application of simultaneous bidding. This leads us to a discussion of nationwide combinatorial bidding in a sequential auction design with a limited amount of simultaneous bidding.

Here are the options for the design of a simultaneous auction.

Options for a Simultaneous Auction



We begin our analysis at extreme form of simultaneity, (a.1, b.1, d.2, e.1).[2] Here all auctions are done together, all possible combinatorial bids are allowed, and all auctions end simultaneously. Such a proposal was made by the NTIA. *It is our view that this combination has a potential for disaster.* (We discuss some of the reasoning behind the NTIA proposal in Appendix A of this report.)

[2] For point of comparison, we recommend that the FCC limit the simultaneity to the two spectrum blocks within an MTA and the five spectrum blocks within a BTA: (a.3), (b.2), (d.1), (e.1).

Problem #1: Budget constraints get broken

The first problem with this generalized type of combinatorial bidding is that it is difficult for firms to bid according to a budget constraint. The following example illustrates the problem. A company with $12 million to spend in total is bidding for a license in Florida. It is competing with a company that has put in a combination bid for Florida, Texas and Louisiana. After the first round of auctions the situation is:

Territory	**Highest Individual Bids ($ MM)**	**Combination Bid ($MM)**
Florida	10	
Texas	20	
Louisiana	15	
TOTAL	**45**	**50**

Since the combination bid is higher than the total of the individual highest bids, the company that has put in the highest individual bid for Florida, at $10 MM, believes that it is not going to win. The company would have to increase its bid to $16 million for Florida to defeat the current $50 MM combination bid. However, the $16 million exceeds the bidder's budget, and therefore in the next round the company cannot expect to win this license. It then looks for a new strategy. Thus the company decides to bid for another territory that it can get within its budget constraint. Suppose that in the subsequent round of bidding, it places the highest bid for Washington State at $8 million. At the same time, however, bids for Texas drive the individual price for Texas up to $28 million. The total of the individual bids for Florida, Texas, and Louisiana is now greater than the combination bid for these regions, so that our original bidder finds itself with two highest bids, the first in Washington state, the second in Florida:

Territory	**Individual Bids ($ MM)**	**Combination Bid ($MM)**
Florida	10	
Texas	28	Total of 50
Louisiana	15	
TOTAL	**53**	**50**

If no other bids change the outcome, our bidder finds that it is faced with two winning bids and owes more than its budget.

In the above example, the budget constraint was "unintentionally" violated. But there are also strategic reasons why firms would want to bid more than they could afford: firms can reasonably expect that they will not win all auctions.[3] They will bid based on expected costs meeting their budget (with some conservatism built in). Consider a firm that can afford only one license. If it believes that its bid has a 10% chance of winning a license, it might bid for eight licenses, hoping to come up with one.

This type of aggressive bidding is to be encouraged (see Professor McAfee's first report) and is viewed as an important part of the simultaneous auction process, whether or not there is combinatorial bidding. *In a simultaneous auction, if firms only bid up to their actual budget, they will be very limited in the number of licenses for which they can bid.* To take the simplest example, in a sequential auction, a firm with a $10 MM budget can bid this ten million in each of 49 MTA auction until this bid finally wins. Thus, if the firms finally wins at the 49th auction, it would have made up to $490 million of bids. But in a simultaneous version, a cautious bidder must choose which of the MTAs to seek. This is not an easy choice and imposes a real constraint for bidders with limited budget.

It is in theory possible to allow firms to state a budget constraint along with their bids and give priority to some bids over others so as to always satisfy a budget constraint. However, in the case of all possible combinatorial bidding, the complications created take us well beyond the frontiers of auction theory, never mind the practical problems of implementation. We would not want to be responsible for developing bidding strategies in such a complicated auction.[4]

One way that the budget constraint problems described above can be solved is to allow bids to be retracted (or defaulted upon at some small price); the latter solution has been proposed by Professor McAfee. In this way, the first company could have withdrawn its

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[3] Similar problems arise in the academic job market. Because of the simultaneous nature of the job offers and the small "hit" rate, we are often forced to make more offers than we have slots. If you only make one offer, you will usually fail to hire the one body that you need to have. If everyone accepts, you have neither the budget nor the courses to employ all the new faculty members.

[4] In fairness, the complications of a priority system are less severe in the case of a simultaneous auction without combinatorial bidding.

bid for Florida when it won Washington state.[5] Or, our firm could bid for several MTAs at once, knowing that it is unlikely to win more than one license and that it can default on some of the licenses if its bidding ends up being too successful.

Problem #2: Allowing bids to be retracted only creates other problems.

Allowing bids to be withdrawn or allowing low-cost defaults creates new problems. If the first firm withdraws its bid for Florida, then the firm with the second highest bid wins, but the second highest bidder may also have followed a similar strategy and not want Florida any more either. This logically leads to a situation where the prices over the course of the auction fluctuate up and down, rather than progressing upward. If winning bids can be retracted, a bid becomes a form of no-cost or low-cost option to purchase the license for an area, rather than a commitment to buy.[6]

Allowing people to withdraw bids leads to a wholly unacceptable form of auction. Taking away bids can have a daisy chain effect and no one knows whether something will or will not be a winning bid. It becomes all that much harder to understand the information from the auction or to determine when to close the auction.

The alternative is not much better. Not allowing bids to be withdrawn forces firms to be too conservative in all simultaneous auctions. In the case with all combinatorial bidding, the budget constraint could even be violated unintentionally.

In an idealized market with the mythical Walrasian auctioneer, we would find a set of prices so that supply exactly equals demand: at the equilibrium prices, the demand for each license would be exactly one. While economic theory tells us that such an equilibrium exists, it does not help us to find it. Since players can be expected to bid strategically, and because there are complicated interdependencies among the values of the different licenses, there is no simple dynamic process that leads to an equilibrium.

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[5] One might allow firms to withdraw "losing" bids at no cost.

[6] People like to use stock market analogy as the textbook example of an efficient market. But stock prices can go both down and up. In an auction, they can only go up. That suggests that no matter what type of auction we use, there will be a problem.

The budget constraint and bid retraction problems together argue against a simultaneous auction with all combinations available. But there are additional problems.

Problem #3: The gains of flexibility are somewhat of an illusion.

Allowing people to make any combination of bids only has the appearance of having an advantage of flexibility. The person with the winning bid in Florida finds himself or herself stuck with a losing bid that becomes a winning bid. Or, they are unable to participate in other regions until the Florida outcome has been resolved, but that could be at the end of the auction.

You only have flexibility if you can change your strategy mid-course. To the extent that you have winning bids (or even losing bids that might become winning bids), there is no flexibility.

There is still the argument that allowing all possible bids provides the best information to the market. Even that is somewhat doubtful.

Problem #4: The price for each region is not transparent

Another serious problem with allowing all possible combinatorial bidding, *especially non-conforming bids*, is that firms will have no idea what the price is for any region. To take an example, if there is a winning combinatorial bid for Florida, Louisiana, and Georgia and the second-highest bid was for a combination of Louisiana and North Carolina while there was another serious bid for Florida and Alabama, what price should we assign to the Georgia bidder to announce the discrepancy that he or she would have to increase his or her bid by in order to prevail?

Recall that the efficient allocation mechanism deals with non-conforming bids in the following manner. It finds the allocation among all feasible allocations that maximizes total value of the licenses. Having found the allocation, *the problem is that there is no obvious price to assign to each individual license.* We know how much the packages cost, but there is no breakdown of packages into each component piece. If licenses are being awarded on a combinatorial basis, it is not reasonable to tell each bidder how much they *in isolation* would have to raise their bid in order to be assigned a license. That could be a unreasonably large amount. It is like telling a regional bidder how much they alone

would have to raise their bid in order to defeat a national license. Confusion would reign.[7]

The arguments against allowing all possible combinatorial bidding in a simultaneous auction include bidding complexity, the absolute necessity for computerized bidding, the difficulty of obeying budget constraints, the incentive to default, and the opacity of price information feedback in the iterative rounds. These seem to outweigh the potential gains. The problem with allowing all possible combinatorial bidding is that the auction process gets out of control.

A more limited form of combinatorial bidding, such as a few pre-designated combinations, would be more reasonable. The most natural pre-designated combinations are a national 30 MHz license, and combining the BTA licenses into an MTA and/or national licenses. It is not that we object to a few regional combinations; the problem is that we have no good way of picking the regions in advance. Some firms would like to see an East-West division, others North-South; some want New Jersey to go with New York while others want it to go with Pennsylvania. Picking regions is a difficult and controversial topic and we don't want to get distracted from the more important issues. When we return to discuss combinatorial bidding, we limit attention to national combinatorial bidding. The combinatorial bidding that would allow aggregation of BTAs into an MTA follows an identical argument.

We now turn our attention to the issue of running a simultaneous auction without combinatorial bidding (b.4). We are not in favor of this approach, but it is an area where reasonable people could hold different opinions.

As suggested in the proposals of PacTel, PacBell and Nevada Bell, allowing all auctions to proceed simultaneously provides valuable information to the bidders. It also allows a certain amount of increased flexibility, depending on the scope of the simultaneity.

In our minds, there are still four problems. As we described earlier, there remains an incentive to bid beyond one's budget. One does not unintentionally end up going over,

[7] As Professor Isaac states in his comments for CTIA, "These drawbacks have the potential for being fatal, but the auction has never been tested." We would change Professor Isaac's "but" to "and furthermore". Given the danger, the FDA would not allow such a large-scale human experiment without extensive testing. Given the stakes, the FCC should share this caution.

but there is a reason to bid based on expected number of licenses won. Otherwise, firms will be very limited in the extent of their bidding. There remains an incentive to allow withdrawal of winning bids or low-cost defaults. There are two additional problems on which we focus our attention. Simultaneous auctions do not give firms much time to reconsider their bids; the reason is that there are too many decisions to be made at once. The other problem, and one for which there is no good solution, is that there is no ideal stopping rule.

Problem #5: Under (a.1), bidding complexity is an issue.

Putting all 2,538 licenses together in one auction may shorten the bidding time (and it may not), but it does not give firms very much time to consider and update their bids. To take it to an extreme, even if a bidding executive can devote ten full hours (36,000 seconds) to the bidding each day, since there are 2,538 auctions going on simultaneously this leaves only 14 seconds per day to evaluating the bidding in each auction and deciding on the next round bid in that market. If the executive can restrict attention to the 1,562 non-designated licenses (A, B, E, F, and G) this increases the decision time up to 23 seconds per bid. This is just with simultaneous bidding and no combinatorial bidding. This helps explain why some authors have recommended allowing three days between bids and selling only one band (all 488 BTAs) on the block together; even here, our executive working three full eight hour days on this matter will still have less than 3 minutes to devote to each bid. Since we run this 488 license auction five times, bidders will also have to strategize about when to bid high and when to wait for the next round.

The implication of this exercise is that even with simultaneous auctions, most bidders will only be able to focus on a few markets and there will probably be many market imperfections. If markets clear sequentially, there will inevitably still be some imperfections, but our judgment is that, on average, decision makers will make better bids. There is no theory that gives a definitive answer as to which is best: all auction designs have flaws.

The need for reflection and multiple rounds of bidding appears to go up more than linearly when you combine licenses across regions. In contrast, there is almost no increase in the time needed to process information when you combine nearly identical licenses (such as A & B or E, F, & G). Thus there is also some reason to doubt that there will be any time saving from creating a system of large simultaneous auctions run in

sequence --- it could even end up much worse. If there are three business days between bids and the whole auction has to be rerun six times (once for the two 30 MHz MTAs, once for the 20 MHz BTA, and once for each of the four 10 MHz BTA bands), this process could easily extend over several months. If there are only 16 rounds of bidding before all the licenses are sold, then the process will not be concluded for one year. This does not seem impossible, nor even unlikely, since the bidding increments are constantly being adjusted in order to keep some auctions open when the number of active bidders is small. The reason why our version of the sequential auction is more efficient is that you don't have to think about the same BTA licenses in three or four sequential auctions. Even combining only the E, F, and G licenses saves a factor of 3 in decision-making time. If these same licenses are sold in sequence (because the simultaneous bidding only covers one band) then in each round, bidders have to readjust the value of each BTA license to take account of the new information that has been provided and that is now relevant.

Problem #6: Under (a.1), there is no sensible simultaneous stopping rule (e.1).

Attempting to find a practical rule that stops all auctions simultaneously seems to be an impossible task. Take, for example, the ingenious proposal of Professors Milgrom and Wilson [(d.2), (e.1)], that the auction ends if no license has a bid that exceeds the previous day's bid by some stated percentage, such as 5%. While this appears sensible, if some group wishes to prolong the auction, they can do so by continuously bidding up the price of a low-priced BTA by just over 5%. We are then faced with the likelihood of the auction continuing for a very long time since this is a very low-cost delay tactic. Since a firm can guarantee to prolong the auction, why should it bid in the early stages? A firm has much more flexibility if it is not constrained by any of its extant bids. Thus a firm would do well to ensure that the auction continues and then when it seems to settle down, jump in. Of course, if several players adopt this strategy, the result will be confusion and a greatly prolonged auction process.

At the other extreme (d.3), NTIA proposes to end the auction [p. 19] "...at some time, not known in advance, when bidding activity has died down." This definition is left vague so that we have a random stopping rule. This seems to be an invitation to lawsuits. Many firms may have reason to believe that they are still active. To the extent that firms must make all of their decisions immediately because of fear that the auction will close, this turns the result into a giant simultaneous sealed-bid auction. You cannot afford to wait

before making all of your bids. But this goes exactly against the spirit of why we want to have open bidding. The goal is to get information out on the table. If you have to bid all at once, it will be much more difficult to adjust your strategy as the auction progresses.

The paradox is as follows: until there is a threat that the auction will close, there is no advantage to bid and several reasons not to. Once the threat becomes real, everyone has to bid all at once and the result becomes like a giant simultaneous sealed-bid auction. There is an analogy in negotiations: deadlines do wonders for getting people to compromise. What is the advantage of offering concessions while there is still no cost of waiting? Bidding in the auction should not become a game of brinkmanship.

The general point is that there is no satisfactory way to end all auctions at once. That is a serious problem. If there were a very large offsetting benefit to running all the auctions simultaneously, it might be worth doing. But there is no great offsetting advantage. We summarize the problems below.

In a simultaneous auction, a firm has trouble coordinating its bids because it can still get stuck having the high bid in some region and then it can't change course (even though the rest of its coordinated strategy may no longer be feasible). Once again, imagine that you are pursuing a Southern strategy and currently have the high bids in Florida, Texas, and Georgia. Then you get outbid in Texas and Georgia and you are left with Florida. Because you still have Florida, you can't go back and change course and pursue a Northeast strategy. Once again there is an incentive to default.

Although there is a lot of information, it can still be hard to interpret. Since the auctions all end at once, one never quite knows where one stands until it is too late. A firm can never count on having won something and then pursue a coordinated strategy based on this assumption. Until the auction is over, nothing has been determined.

Although the auction is simultaneous, there is no guarantee that this feature will speed up the auction's resolution. Even allowing one day between bids, the auction could go on for an unreasonable length of time. We cannot say in advance how many rounds it will take before no one is willing to increase any bid by 5%, or before bidding has died down. If everything is up for grabs, everyone must participate. Having the auction proceed too long is a very costly event. Since everything is going on simultaneously, you can't sit out

the irrelevant parts and only come to what interests you. Everybody has to come to every session for a length of time that the FCC does not control.

The lack of a good stopping rule and the incentive to default (or exceed budget) once again create a potential for a disastrous result.

Since the PCS auction design brings us into uncharted territory, we want to be risk-averse in the auction design. This critique does not rule out all possible simultaneous auction formats. Our focus has been on the problems of allowing all possible combinatorial bids (b.1) and having all bidding stop at once (e.1).

Caution #1: If the Commission adopts a simultaneous auction procedure, do not require that all auctions close at same time. Allow the auctions to close at a separate times (e.2).

Caution #2: If the Commission adopts a simultaneous auction procedure, do not combine the 10 MHz and 30 MHz licenses: eliminate (a.1).

These cautions are in line with the recommendations of PacTel and Professor McAfee. If the auctions can close one at a time, there is much less danger of everything going on too long. There is still an issue of strategically bidding beyond one's budget although one can now imagine priority bidding that could handle this issue in this more limited set of simultaneous bidding.

As we move away from complete simultaneity, there are fewer problems, but the advantages also are also reduced. Since auctions may close at different times, you are back to some sequential element in the bidding. If the three non-designated bands of BTA licenses are not all put together (and are not auctioned simultaneously with the D band), then there will be of necessity a sequence of four large simultaneous auctions. This could greatly extend the auction time since it is not clear how long one of these 488 license auctions will take to close (especially since it has been recommended by Professor McAfee that the FCC only require one new bid every three days to keep an auction open).

An important difference between the sequential format and simultaneous format with separate closing times is that with the latter, the order of the closing is determined endogenously by the "market" rather than exogenously. The gain from allowing

simultaneous bidding is that even the bidders in the auctions that closed first learned something from the other auctions that remained open. To put this differently, imagine that we were to exogenously specify a sequential auction where the order of auctions followed exactly the pattern of closing in our simultaneous auction. The simultaneous auction would be better since early bidders get some information about what will happen (at least lower bounds) in the subsequent auction that have not yet closed; none of this information can be conveyed if the bidding is completely sequential.

However, the auction closing order might not be the same. The order of closing is determined endogenously rather than exogenously. It might well be the case that the "wrong" auctions close first. Knowing the closing price of New York might be much more valuable than the price of Montana. If we think that is true, then we can exogenously specify that New York should close first. That is simply a sequential auction format. In the simultaneous case with separate closing rules, there is no reason to suspect that the most informative markets will close first. The number of people interested in Montana will be small until the relevant regional (or national) hub has been decided. But since the bidding is likely to be very active for the large hub MTAs, it is very possible that firms will not be willing to pay the price to keep bidding in Montana open.

Another feature with endogenous sequencing is that it encourages strategic manipulation of the closing order. Someone could preempt the process in an area with a high initial bid that will lead to the closure of that auction at an early time. This allows an unsatisfactory degree of gaming into the process. For example, imagine that a firm makes a high bid for the Nevada license on the first day of the auction. This may happen because the firm has decided that Nevada will definitely be part of any strategy it adopts, or because it thinks that the high initial bid will scare off any competition, or because the firm knows that the main competition cannot figure out what to bid for Nevada until it knows whether it will have entry into Southern California. Within three days, this bidder has now locked up Nevada, which may also give it a small but perhaps significant edge in the bidding for Southern California. Maybe this won't happen, but if it makes more sense to clear Southern California before Nevada, then the FCC should make sure that gaming strategies will not change that.

Even without gaming, there is a reason to suspect that the endogenous closing order will be backward. Firms that are attempting to form a network might well need to know the outcome of the biggest (or hub) MTAs before deciding on the appropriate smaller MTAs

to pursue. But they cannot keep the bidding alive in all the small MTA regions. Firms that do not know the identities of the big MTA winners will be forced to drop out of the smaller MTA bidding. We foresee an outcome where the smallest MTAs close first. This seems to be exactly the opposite of what most participants think is the desirable closing order. While everyone thinks it would be worthwhile to keep bidding in the small regions, there is a free-rider problem and no one is willing to pay the cost.[8]

Allowing an endogenous closing order gives up control. It makes the bidding more complex. It may extend the auction. The simultaneity leaves some incentive either to default or to bid cautiously and thus not participate in most of the auctions. There is no guarantee that the simultaneous auction will provide better information taking into account that the closing order might well be the reverse of what we think is the most useful. If this sounds frustrating, it is worth keeping in mind that every system has a flaw. Our preferred options have their own flaws. When we are making choices, we are picking which flaws to take over others.

The problems with the alternatives for more extensive simultaneous bidding bring us back to our original proposal. There is a role for a limited form of simultaneous bidding, namely combining the A & B blocks together within an MTA; running the C & D block BTAs as simultaneous auctions; and combining the E, F, & G licenses of a BTA block, (a.3). In this limited form of simultaneity, most of the bidding will be mutually exclusive. For example, firms that choose the "A" MTA license are ineligible for the "B" license. This solves many of the interdependence problems and the need for a complicated stopping rule. The auction can stop when there are no new bids (d.1).

This limited simultaneity has advantages in simplifying bidding strategy and shortening the auction time.

1. Putting together the licenses within a region avoids the strategy question of when to bid for a license. There is bidding for all the licenses in an MTA at the same time. You don't end up outsmarting yourself by waiting after the first auction for the second. In the case of the non-preferential BTAs, one doesn't have to play the strategy game across

[8] The proposal to change the minimum bidding increments in order to have all auctions close at around the same time might well end up keeping all the auctions alive for an unreasonable period of time. Moreover, if more bidders jump back into an auction, then the auction is likely to close more quickly, just when the interest returns.

three different auctions. Allowing bidding for the C and D bands to occur simultaneously with the combined auction for E, F, and G bands helps provide valuable information to the designated bidders.

2. The other significant advantage is that it will make the auctions much quicker. Just combining the E, F, and G bands will shorten the auction time by just under 40%.[9] Going further and running the C and D auctions simultaneously with the E, F, and G bands (where different people are eligible to bid for the different licenses) could shorten the auction time by 79%.[10] The time savings is not a small matter. We want to both give bidders a reasonable amount of time between auctions and yet resolve 2,538 auctions in a timely fashion. Cutting the time by almost 80% makes the sequential auction structure much more attractive and greatly reduces the need to experiment with a more general simultaneous bidding format.

3. Putting together the A and B blocks in an MTA (and aggregating E, F, and G within a BTA) avoids what we consider a very self-interested form of sequential ordering. MCI has proposed auctioning all of the A licenses and then all of the B licenses. In addition to being much more time consuming, there is a real question of why we should proceed to another region before everyone knows who has won the other license. The first winner is at a significant advantage.[11] Putting the two MTA licenses at such different informational points in the auction really creates a need to strategize between going for the first or waiting for the second license.[12] What is the possible advantage of this approach? MCI has suggested that the national combinatorial bidding precedes each of the regional sequences. Putting the B block national bidding right before the B regional bidding could also be described as putting the B national bidding right after the conclusion of all the A regional bidding. This in fact allows national bidding to follow regional bidding. This

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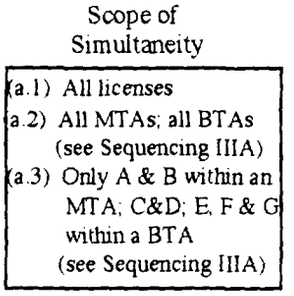
[9] Since the BTA regions represent 96% of the auctions, going from 2 to 1 auction per MTA and from 5 to 3 auction per BTA is a savings of just under 40%.

[10] Since the BTA regions represent 96% of the auctions, going from 5 to 1 auction per BTA along with the 2 to 1 reduction per MTA is a savings of 79%. See discussion of proposed auction design that follows.

[11] For example, the first winner of New York is advantaged relative to the second winner of New York by having a round to compete for all the other MTA licenses while the other bidders (including the eventual winner) do not know who has won the second New York license.

[12] There is a small amount of strategy if the A and B licenses are auctioned off sequentially one right after the other. There is the issue of which will be the better deal. However, if all A licenses are auctioned off before all B licenses, then there is much more information available in the second round and this further opens the door for strategic behavior.

strikes us as stacking the deck towards national combinatorial bidding. It's the type of game playing that we seek to discourage.[13]



As suggested in the above decision tree, there are three approaches to simultaneity. One can do everything at once --- one grand auction. One can do the A and B MTAs together, and then have up to five BTA auctions, for a total of six long auctions. Or, one can put the A and B bands together within an MTA, the E, F, and G bands together within a BTA and run the C and D auctions alongside the E, F, and G bidding. This results in 49 sequential MTA auctions followed by 488 sequential BTA license auctions.

We think it is simpler for people to bid when the simultaneity is across the two MTA bands in a region (say New York) than when people have to simultaneously bid for both New York and Los Angeles. The E, F, and G licenses in a given region should be sold at the same time because they are so similar in nature that firms should focus their attention on these licenses just one time. Selling them simultaneously will eliminate the need to strategize over when to bid for the particular BTA license. Allowing the C and D bands in that region to also be sold in a separate but simultaneous auction gives the designated bidders information about the unconstrained market value of this license and shortens the auction.

Experimenting with simultaneity across regions

We are willing to consider simultaneous bidding for the BTA licenses within an MTA. If the Commission wishes to go further towards simultaneous bidding, it might experiment

[13] Another example of game playing by MCI is to allow for a Vickrey auction in the national combinatorial bidding. This is a strategic ploy to allow MCI to compare its first-highest price to the second-highest prices that come out of the regional auctions. Our proposed solution is exactly the reverse: as we discuss below, we propose moving the national bidding to an English or Japanese auction so as to limit the bidding to the second-highest price and put the two auctions on equal footing (see discussion that follows).